

AMENDMENT TO THE CLAIMS

Claims pending

- At time of the Action: Claims 1-76.
- After this Response: Claims 1-76.

Canceled or Withdrawn claims: None

Amended claims: 1, 23, and 57

New claims: None

1. **(Currently Amended)** A method ~~for compressing concentric mosaic image data having a plurality of frames, the method~~ comprising:

compressing concentric mosaic image data having a plurality of frames, the compressing comprising:

selectively dividing the plurality of frames into a plurality of anchor frames and a plurality of predicted frames;

independently encoding each of the anchor frames; and

encoding a prediction residue for each of the predicted frames, the prediction residue for each of the predicted frames being determined by referring each of the predicted frames to at least one of the anchor frames.

2. **(Original)** The method as recited in Claim 1, wherein independently encoding each of the anchor frames further includes:

segmenting each of the anchor frames into a plurality of anchor frame macroblocks; and

independently encoding each of the anchor frame macroblocks.

1
2 3. **(Original)** The method as recited in Claim 2, wherein
3 independently encoding each of the anchor frame macroblocks further includes:

4 subdividing each anchor frame macroblock into a plurality of subblocks;
5 transforming each subblock by a discrete cosine transform (DCT); and
6 entropy encoding each transformed subblock using a Huffman coder.

7
8 4. **(Original)** The method as recited in Claim 3, wherein subdividing
9 each anchor frame macroblock into the plurality of subblocks further includes
10 subdividing each anchor frame macroblock into at least one chrominance subblock
11 and at least one luminance subblock.

12
13 5. **(Original)** The method as recited in Claim 3, wherein the discrete
14 cosine transform (DCT) includes a basis-8 DCT and quantization of DCT
15 coefficients by a quantization scale associated with the plurality of anchor frames.

16
17 6. **(Original)** The method as recited in Claim 1, wherein encoding
18 the prediction residue for each of the predicted frames further includes:

19 segmenting the at least one anchored frame into a plurality of anchor frame
20 macroblocks;

21 segmenting each of the predicted frames into a plurality of predicted frame
22 macroblocks; and

23 encoding each of the predicted frame macroblocks using motion
24 compensation.

1 7. **(Original)** The method as recited in Claim 6, wherein encoding
2 each of the predicted frame macroblocks using motion compensation further
3 includes:

4 for each predicted frame macroblock, selectively determining a
5 significantly best match within one or more anchor frame macroblocks;

6 determining a reference vector for each predicted frame macroblock within
7 each predicted frame, the reference vector indicating a position of the significantly
8 best match within the one or more anchor frame macroblocks;

9 for each predicted frame macroblock, determining a prediction residue for
10 the predicted frame macroblock by the difference between a predicted frame
11 macroblock value and an anchor frame match value.

12
13 8. **(Original)** The method as recited in Claim 7, wherein encoding
14 each of the predicted frame macroblocks using motion compensation further
15 includes decoding each of the encoded anchor frames.

16
17 9. **(Original)** The method as recited in Claim 7, wherein determining
18 the prediction residue for the predicted frame macroblock further includes:

19 for each predicted frame macroblock, transforming residue by a discrete
20 cosine transform (DCT); and

21 entropy encoding each transformed residue using a Huffman coder.

22
23 10. **(Original)** The method as recited in Claim 9, wherein the discrete
24 cosine transform (DCT) includes a basis-8 DCT and quantization of DCT
25

1 coefficients by a quantization scale associated with the plurality of predicted
2 frames.

3
4 11. **(Original)** The method as recited in Claim 9, wherein encoding
5 each of the predicted frame macroblocks using motion compensation further
6 includes using a translation-based motion model.

7
8 12. **(Original)** The method as recited in Claim 9, wherein encoding
9 each of the predicted frame macroblocks using motion compensation further
10 includes using an affine motion model.

11
12 13. **(Original)** The method as recited in Claim 9, wherein encoding
13 each of the predicted frame macroblocks using motion compensation further
14 includes using a perspective motion model.

15
16 14. **(Original)** The method as recited in Claim 1, further comprising
17 outputting a bitstream having encoded anchor frame data, encoded predicted frame
18 data, and indexing data.

19
20 15. **(Original)** The method as recited in Claim 1, further comprising
21 outputting a bitstream having encoded anchor frame data associated with an
22 anchor frame macroblock group (MBG) and corresponding indexing data.

1 16. **(Original)** The method as recited in Claim 14, further comprising
2 outputting a bitstream that includes a thumbnail image of at least a portion of the
3 concentric mosaic data.

4
5 17. **(Original)** The method as recited in Claim 14, wherein the
6 bitstream further includes quantization scale information.

7
8 18. **(Original)** The method as recited in Claim 14, wherein the
9 encoded predicted frame data includes encoded prediction residue.

10
11 19. **(Original)** The method as recited in Claim 14, wherein the
12 indexing data is configured to identify each encoded anchor frame and each
13 encoded predicted frame.

14
15 20. **(Original)** The method as recited in Claim 19, wherein the
16 encoded anchor frame data is further configured to identify encoded macroblock
17 groups (MBGs) within each encoded anchor frame.

18
19 21. **(Original)** The method as recited in Claim 19, wherein the
20 encoded predicted frame data is further configured to identify encoded predicted
21 frame macroblocks within each encoded predicted frame.

22
23 22. **(Original)** The method as recited in Claim 19, wherein the
24 encoded predicted frame data is further configured to identify encoded predicted
25 frame macroblock groups (MBGs) within each encoded predicted frame.

1
2 23. **(Currently Amended)** A computer-readable medium having
3 computer-executable instructions that, when executed, perform acts for use in
4 ~~compressing concentric mosaic image data having a plurality of frames, the~~
5 ~~computer-executable instructions providing steps comprising:~~

6 compressing concentric mosaic image data having a plurality of frames by:

7 selectively dividing the plurality of frames into a plurality of anchor
8 frames and a plurality of predicted frames;

9 independently encoding each of the anchor frames; and

10 encoding a prediction residue for each of the predicted frames, the
11 prediction residue for each of the predicted frames being determined by
12 referring each of the predicted frames to at least one of the anchor
13 frames.

14
15 24. **(Original)** The computer-readable medium as recited in Claim 23,
16 wherein independently encoding each of the anchor frames further includes:

17 segmenting each of the anchor frames into a plurality of anchor frame
18 macroblocks; and

19 independently encoding each of the anchor frame macroblocks.

20
21 25. **(Original)** The computer-readable medium as recited in Claim 24,
22 wherein independently encoding each of the anchor frame macroblocks further
23 includes:

24 subdividing each anchor frame macroblock into a plurality of subblocks;

25 transforming each subblock by a discrete cosine transform (DCT); and

1 entropy encoding each transformed subblock using a Huffman coder.

2
3 26. **(Original)** The computer-readable medium as recited in Claim 25,
4 wherein subdividing each anchor frame macroblock into the plurality of subblocks
5 further includes subdividing each anchor frame macroblock into at least one
6 chrominance subblock and at least one luminance subblock.

7
8 27. **(Original)** The computer-readable medium as recited in Claim 25,
9 wherein the discrete cosine transform (DCT) includes a basis-8 DCT and
10 quantization of DCT coefficients by a quantization scale associated with the
11 plurality of anchor frames.

12
13 28. **(Original)** The method as recited in Claim 23, wherein encoding
14 the prediction residue for each of the predicted frames further includes:

15 segmenting the at least one anchored frame into a plurality of anchor frame
16 macroblocks;

17 segmenting each of the predicted frames into a plurality of predicted frame
18 macroblocks; and

19 encoding each of the predicted frame macroblocks using motion
20 compensation.

21
22 29. **(Original)** The computer-readable medium as recited in Claim 28,
23 wherein encoding each of the predicted frame macroblocks using motion
24 compensation further includes:

1 for each predicted frame macroblock, selectively determining a
2 significantly best match within one or more anchor frame macroblocks;

3 determining a reference vector for each predicted frame macroblock within
4 each predicted frame, the reference vector indicating a position of the significantly
5 best match within the one or more anchor frame macroblocks;

6 for each predicted frame macroblock, determining a prediction residue for
7 the predicted frame macroblock by the difference between a predicted frame
8 macroblock value and an anchor frame macroblock value.

9
10 30. **(Original)** The computer-readable medium as recited in Claim 29,
11 wherein encoding each of the predicted frame macroblocks using motion
12 compensation further includes decoding each of the encoded anchor frames.

13
14 31. **(Original)** The computer-readable medium as recited in Claim 29,
15 wherein determining the prediction residue for the predicted frame macroblock
16 further includes:

17 for each predicted frame macroblock, transforming residue by a discrete
18 cosine transform (DCT); and

19 entropy encoding each transformed residue using a Huffman coder.

20
21 32. **(Original)** The computer-readable medium as recited in Claim 31,
22 wherein the discrete cosine transform (DCT) includes a basis-8 DCT and
23 quantization of DCT coefficients by a quantization scale associated with the
24 plurality of predicted frames.

1 33. **(Original)** The computer-readable medium as recited in Claim 31,
2 wherein encoding each of the predicted frame macroblocks using motion
3 compensation further includes using a translation-based motion model.

4
5 34. **(Original)** The computer-readable medium as recited in Claim 23,
6 wherein the computer-executable instructions further include the step of outputting
7 a bitstream comprising encoded anchor frame data, encoded predicted frame data,
8 and indexing data.

9
10 35. **(Original)** The computer-readable medium as recited in Claim 34,
11 wherein the bitstream further includes quantization scale information.

12
13 36. **(Original)** The computer-readable medium as recited in Claim 34,
14 wherein the encoded predicted frame data includes encoded prediction residue.

15
16 37. **(Original)** The computer-readable medium as recited in Claim 35,
17 wherein the indexing data is configured to identify each encoded anchor frame and
18 each encoded predicted frame.

19
20 38. **(Original)** The computer-readable medium as recited in Claim 37,
21 wherein the encoded anchor frame data is further configured to identify encoded
22 anchor frame macroblock groups (MBGs) within each encoded anchor frame.

1 39. **(Original)** The computer-readable medium as recited in Claim 37,
2 wherein the encoded predicted frame data is further configured to identify encoded
3 predicted frame macroblock groups (MBGs) within each encoded predicted frame.
4

5 40. **(Original)** An apparatus comprising:
6 memory suitable for storing concentric mosaic image data having a
7 plurality of frames;

8 logic operatively coupled to the memory and configured to selectively
9 divide the plurality of frames into a plurality of anchor frames and a plurality of
10 predicted frames, independently encode each of the anchor frames, and encode a
11 prediction residue for each of the predicted frames, the prediction residue for each
12 of the predicted frames being determined by referring each of the predicted frames
13 to at least one of the anchor frames.
14

15 41. **(Original)** The apparatus as recited in Claim 40, wherein the logic
16 is further configured to segment each of the anchor frames into a plurality of
17 anchor frame macroblocks and independently encode each of the anchor frame
18 macroblocks.
19

20 42. **(Original)** The apparatus as recited in Claim 41, wherein the logic
21 is further configured to subdivide each anchor frame macroblock into a plurality of
22 subblocks, transform each subblock by a discrete cosine transform (DCT), and
23 entropy encode each transformed subblock using a Huffman coder.
24
25

1 43. **(Original)** The apparatus as recited in Claim 42, wherein the logic
2 is further configured to subdivide each anchor frame macroblock into at least one
3 chrominance subblock and at least one luminance subblock.

4
5 44. **(Original)** The apparatus as recited in Claim 42, wherein the
6 discrete cosine transform (DCT) includes a basis-8 DCT and quantization of DCT
7 coefficients by a quantization scale associated with the plurality of anchor frames.

8
9 45. **(Original)** The apparatus as recited in Claim 40, wherein the logic
10 is further configured to segment the at least one anchored frame into a plurality of
11 anchor frame macroblocks, segment each of the predicted frames into a plurality
12 of predicted frame macroblocks, and encode each of the predicted frame
13 macroblocks using motion compensation.

14
15 46. **(Original)** The apparatus as recited in Claim 45, wherein the logic
16 is further configured to encode each of the predicted frame macroblocks using
17 motion compensation by, for each predicted frame macroblock, selectively
18 determining a significantly best match within one or more anchor frame
19 macroblocks, determining a reference vector for each predicted frame macroblock
20 within each predicted frame, the reference vector indicating a position of the
21 significantly best match within the one or more anchor frame macroblocks, and for
22 each predicted frame macroblock, determining a prediction residue for the
23 predicted frame macroblock by the difference between a predicted frame
24 macroblock value and an anchor frame macroblock value.

1 47. **(Original)** The apparatus as recited in Claim 46, wherein the logic
2 is further configured to encode each of the predicted frame macroblocks using
3 motion compensation by first decoding each of the associated encoded anchor
4 frames.

5
6 48. **(Original)** The apparatus as recited in Claim 47, wherein the logic
7 is further configured to, for each predicted frame macroblock, transform residue
8 by a discrete cosine transform (DCT), and entropy encode each transformed
9 residue using a Huffman coder.

10
11 49. **(Original)** The apparatus as recited in Claim 48, wherein the
12 discrete cosine transform (DCT) includes a basis-8 DCT and quantization of DCT
13 coefficients by a quantization scale associated with the plurality of predicted
14 frames.

15
16 50. **(Original)** The apparatus as recited in Claim 48, wherein the logic
17 is further configured to use a translation-based motion model to encode each of the
18 predicted frame macroblocks using motion compensation.

19
20 51. **(Original)** The apparatus as recited in Claim 40, wherein the logic
21 is further configured to output a bitstream comprising encoded anchor frame data,
22 encoded predicted frame data, and indexing data.

23
24 52. **(Original)** The apparatus as recited in Claim 51, wherein the
25 bitstream further includes quantization scale information.

1
2 53. (Original) The apparatus as recited in Claim 51, wherein the
3 encoded predicted frame data includes encoded prediction residue.
4

5 54. (Original) The apparatus as recited in Claim 51, wherein the
6 indexing data is configured to identify each encoded anchor frame and each
7 encoded predicted frame.
8

9 55. (Original) The apparatus as recited in Claim 54, wherein the
10 encoded anchor frame data is further configured to identify encoded anchor frame
11 macroblock groups (MBGs) within each encoded anchor frame.
12

13 56. (Original) The apparatus as recited in Claim 54, wherein the
14 encoded predicted frame data is further configured to identify encoded predicted
15 frame macroblock groups (MBGs) within each encoded predicted frame.
16

17 57. (Currently Amended) A method for ~~decompressing a bitstream~~
18 ~~having encoded anchor frame data, encoded predicted frame data, and indexing~~
19 ~~data associated with compressed concentric mosaic image data having a plurality~~
20 ~~of frames, the method comprising:~~

21 decompressing a bitstream having encoded anchor frame data, encoded
22 predicted frame data, and indexing data associated with compressed concentric
23 mosaic image data having a plurality of frames, said decompressing comprising:

24 accessing the index data to identify:
25

1 a unique location for each encoded anchor frame within the encoded
2 anchor frame data and from each encoded anchor frame each encoded
3 anchor frame macroblock group (MBG) therein, and

4 a unique location for each encoded predicted frame within the
5 encoded predicted frame data and from each encoded predicted frame
6 each encoded predicted frame macroblock group (MBG) therein; and

7 for each new view to be rendered:

8 determining which encoded anchor frame MBGs and encoded
9 predicted frame MBGs are to be used in rendering the new view;

10 selectively decoding the encoded anchor frame MBG to be used in
11 rendering the new view; and

12 selectively decoding the predicted frame MBG using all referenced
13 decoded anchor frame MBGs for the predicted frame MBG.

14
15 **58. (Original)** The method as recited in Claim 57, wherein selectively
16 decoding the encoded anchor frame MBG to be used in rendering the new view
17 further includes:

18 for each encoded anchor frame MBG to be used in rendering the
19 new view, determining:

20 if the encoded anchor frame MBG has an existing corresponding
21 decoded anchor frame MBG, and if so, using the existing corresponding
22 decoded anchor frame MBG in rendering the new view,

23 otherwise, decoding the encoded anchor frame MBG to be used in
24 rendering the new view.
25

1 59. **(Original)** The method as recited in Claim 57, wherein selectively
2 decoding the predicted frame MBG using all referenced decoded anchor frame
3 MBGs for the predicted frame MBG further includes:

4 for each encoded predicted frame MBG to be used in rendering the new
5 view, determining:

6 if the encoded predicted frame MBG has an existing corresponding
7 decoded predicted frame MBG, and if so, using the existing
8 corresponding decoded predicted frame MBG in rendering the new
9 view, otherwise

10 decoding the predicted frame MBG using all referenced decoded
11 anchor frame MBGs for the predicted frame MBG.

12
13 60. **(Original)** The method as recited in Claim 57, wherein each
14 encoded predicted frame includes a prediction residue associated with at least one
15 referenced anchor frame.

16
17 61. **(Original)** The method as recited in Claim 57, wherein decoding
18 the encoded anchor frame macroblock to be used in rendering the new view
19 further includes using an inverse discrete cosine transform (DCT).

20
21 62. **(Original)** The method as recited in Claim 61, wherein the
22 inverse discrete cosine transform (DCT) includes an inverse quantization of DCT
23 coefficients by a quantization scale associated with the plurality of predicted
24 frames and an inverse basis-8 DCT.

1 63. **(Original)** The method as recited in Claim 57, wherein the
2 bitstream further includes quantization scale information.

3
4 64. **(Original)** The method as recited in Claim 57, wherein decoding
5 the predicted frame MBG using all referenced decoded anchor frame MBGs for
6 the predicted frame MBG further includes:

7 decoding each referenced encoded anchor frame MBG for which there is no
8 existing corresponding decoded anchor frame MBG; and

9 decoding the predicted frame MBG using motion compensation using a
10 prediction residue.

11
12 65. **(Original)** The method as recited in Claim 57, wherein selectively
13 decoding the encoded anchor frame MBG to be used in rendering the new view
14 further includes storing the decoded anchor frame MBG in a first memory cache.

15
16 66. **(Original)** The method as recited in Claim 65, wherein selectively
17 decoding the predicted frame MBG the referenced decoded anchor frame MBGs
18 for the predicted frame MBG further includes storing the decoded predicted frame
19 MBG in a second memory cache.

20
21 67. **(Original)** The method as recited in Claim 57, further comprising
22 rendering the new view on at least one output device.

23
24 68. **(Original)** An apparatus comprising:
25

1 memory suitable for storing at least a portion of a bitstream having encoded
2 anchor frame data, encoded predicted frame data, and indexing data associated
3 with a compressed concentric mosaic image data having a plurality of frames; and

4 logic operatively coupled to the memory, the logic including:

5 a rendering engine configured to access the index data to identify a
6 unique location for each encoded anchor frame within the encoded anchor
7 frame data and from each encoded anchor frame each encoded anchor
8 frame MBG therein, and is further configured to access the index data to
9 identify a unique location for each encoded predicted frame within the
10 encoded predicted frame data and from each encoded predicted frame
11 each encoded predicted frame MBG therein, and

12 a decoding engine that, for each new view to be rendered,
13 determines which encoded anchor frame MBGs and encoded predicted
14 frame MBGs are to be used in rendering the new view, selectively
15 decodes the encoded anchor frame MBG to be used in rendering the new
16 view, and selectively decodes the predicted frame MBG using all
17 referenced decoded anchor frame MBGs for the predicted frame MBG.

18
19 69. (Original) The apparatus as recited in Claim 68, wherein the
20 decoder engine is further configured to selectively decode the encoded anchor
21 frame MBG to be used in rendering the new view by, for each encoded anchor
22 frame MBG to be used in rendering the new view, determining if the encoded
23 anchor frame MBG has an existing corresponding decoded anchor frame MBG in
24 the memory, and if so, allowing the rendering engine to use the existing
25 corresponding decoded anchor frame MBG in rendering the new view, otherwise,

1 decoding the encoded anchor frame MBG to be used in rendering the new view
2 and storing the resulting decoded anchor frame MBG to the memory.

3
4 70. **(Original)** The apparatus as recited in Claim 68, wherein the
5 decoder engine is further configured to selectively decode the predicted frame
6 MBG using a decoded anchor frame MBG associated with the predicted frame
7 MBG by, for each encoded predicted frame MBG to be used in rendering the new
8 view, determining if the encoded predicted frame MBG has an existing
9 corresponding decoded predicted frame MBG in the memory, and if so, allowing
10 the rendering engine to use the existing corresponding decoded predicted frame
11 MBG in rendering the new view, otherwise decoding the predicted frame MBG
12 using the referenced decoded anchor frame MBG associated with the predicted
13 frame MBG and storing the resulting decoded predicted frame MBG to the
14 memory.

15
16 71. **(Original)** The apparatus as recited in Claim 68, wherein each
17 encoded predicted frame includes a prediction residue associated with at least one
18 referenced anchor frame.

19
20 72. **(Original)** The apparatus as recited in Claim 68, wherein the
21 decoder engine is further configured to decode the encoded anchor frame
22 macroblock to be used in rendering the new view using an inverse discrete cosine
23 transform (DCT).
24
25

1 73. **(Original)** The apparatus as recited in Claim 72, wherein the
2 inverse discrete cosine transform (DCT) includes an inverse quantization of DCT
3 coefficients by a quantization scale associated with the plurality of predicted
4 frames and basis-8 inverse DCT.

5
6 74. **(Original)** The apparatus as recited in Claim 68, wherein the
7 bitstream further includes quantization scale information.

8
9 75. **(Original)** The apparatus as recited in Claim 68, wherein the
10 decoder engine is further configured to decode the predicted frame MBG using the
11 referenced decoded anchor frame MBG for the predicted frame MBG by:

12 decoding the referenced encoded anchor frame MBG for which there is no
13 existing corresponding decoded anchor frame MBG and storing the resulting
14 decoded anchor frame MBG to the memory; and

15 decoding the predicted frame MBG using motion compensation and a
16 prediction residue.

17
18 76. **(Original)** The apparatus as recited in Claim 68, further
19 comprising at least one output device operatively coupled to the rendering engine,
20 and wherein the rendering engine is further configured to cause the new view to be
21 provided to the output device.